THE FRANKLIN INSTITUTE

COMMITTEE ON SCIENCE AND THE ARTS

No. 2413 *Subject* Curie's Researches Resulting in Discovery of Radium.

Applicant _____

Address _____

Date of Application _____

Inventor _____

Address _____

COMMITTEE:

R. H. Bradbury *Chairman*

Wm. J. Hammer

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H. F. Keller

MEETINGS:

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Report presented to General Committee: _____

Final Action: _____

Award _____

To _____

Report, Medal, and Certificate *presented / forwarded* *to Inventor* _____

HALL OF THE FRANKLIN INSTITUTE.

Philadelphia, January 6, 1909.

No. 2413.

The Franklin Institute of the State of Pennsylvania, acting through its Committee on Science and the Arts, has inquired into the merits of the researches by which Professor and Madame Curie were led to the discovery of radium and makes the following report:-

The year 1895 in which were published Lenard's experiments on the cathode rays and Roentgen's discovery of the X-rays may be said to mark the beginning of a new and most fruitful period in physical science. The first decade of this period will ever be memorable for great achievements, both in the discovery of new facts and in the framing of hypotheses, which have so materially advanced our knowledge of the constitution of matter. Among the experimental researches of this period none, perhaps, will stand out more conspicuously than those which have brought to light the carriers of radioactivity and which have culminated in the discovery and separation of that most powerfully radioactive element, radium. It seems hardly within the scope of this report to review, even briefly, the very numerous discoveries, made by a host of investigators working in widely different fields, which prepared the way for the experimental inquiries of Professor and Madame Curie; but the starting point of these researches was the discovery in 1896, by the late Henri Becquerel, of those wonderful radiations which their discoverer called uranium rays, and which, under the more fitting name of Becquerel rays, we now regard as a manifestation of radioactivity.

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A study of the phosphorescence of certain uranium salts, such as the double sulphate of ammonium or potassium and uranium, led Mme. Curie to undertake a systematic examination of other substances for Becquerel rays, and she found that thorium compounds also emit them. Quantitative determinations of the radioactivity of various uranium and thorium minerals then disclosed the fact that this property was not proportional to their uranium or thorium content and that some of the minerals were indeed several times as radioactive as the free elements. Having ascertained that the radioactivity of uranium is an atomic property, i. e., a property not affected by combination with other elements, Mme. Curie argued that strongly radioactive minerals, like pitchblende, must contain some unknown substance of greatly superior radioactivity, and, joining forces with her husband, the late Pierre Curie, she proceeded to search for the hypothetical constituent. The Austrian Government aided the investigators by placing at their disposal a ton of uranium residues from the Imperial factory at Joachimsthal, and it was from this material that, by means of suitable analytical processes and guided by the extremely sensitive indications of the gold-leaf electroscope, the Curies succeeded in separating, first, the highly radioactive substance which they named polonium, and, later, in conjunction with M. Bemont, the still more active body which they so happily christened radium. Although other radioactive substances, notably Debierne's actinium and Boltwood's ionium have since been extracted from uranium and thorium minerals by other investigators, radium still remains the only one that has been characterized as a chemi-

cal element, and while it has not as yet been obtained in the free or elemental state, it has been isolated in the form of pure salts, such as the chloride, bromide, sulphate and carbonate. Its analytical behavior and other chemical properties were found to be those of the alkaline earth family of elements, and its place in this group was confirmed by Mme. Curie's repeated determinations of its atomic weight, and by a careful study of its spectrum by Demarcay, Runge and others.

In addition to the separation and investigation of the radioactive constituents of pitchblende the Curies have made a most elaborate study of the radiations of these bodies, of the various physical, chemical and physiological effects which the latter produce on other substances and on living tissues, and of the tremendous energy which is manifested in the spontaneous transformations of radium.

The committee charged with the preparation of this report on Professor and Madame Curie's work on the radioactive substances is of the opinion that it constitutes one of the classical researches in physical science and that its principal result, the discovery and characterization of radium is, without doubt, a scientific achievement of the first magnitude. This estimate the committee bases mainly on the following considerations, viz., in the first place, that only a bold scientific imagination could have conceived the idea of instituting the quest for an unknown radioactive constituent of the uranium minerals; secondly, that one cannot help but be deeply impressed with the brilliancy of the method of research which combined an entirely novel analytical agent - the ionisation

of air - with a masterful selection and combination of known chemical reactions; thirdly, that the work could not have been carried to its successful conclusion without the rare skill, the sound judgment and the extraordinary perseverance displayed by the investigators; and fourthly, that the discovery of the carriers of radioactivity has placed at the command of scientists a new source of energy which has already been instrumental in opening up most fruitful avenues of research in a previously untrodden field. Without in any way detracting from the value of the splendid contributions to our knowledge of radioactivity which we owe to Rutherford, Elster and Geitel, Ramsay, Giesel, Soddy, Boltwood and many others, it is safe to say that if it had not been for the epoch-making researches of the Curies, we would still be ignorant of the immensely powerful emanations of radium and thorium, of the transformation of radium emanation into helium, of the apparent degradation of elements of large atomic mass into others of smaller atomic mass, of the differences in the character and effect of the several kinds of radiations and emanations emitted by radioactive bodies, and, further, the numerous applications of radioactivity to biological, medical, geological and cosmic problems which have been recorded, would not have been made in our time.

In view, then, of the invaluable services which Prof. and Mme. Curie have rendered to science, the committee recommend that the highest award of the Franklin Institute, the Elliott Cresson Medal, be bestowed upon Mme. Sklodowska Curie of Paris, as a recognition

of her share in this work, and as a tribute to the memory of her lamented husband, Pierre Curie, whose indefatigable cooperation so largely contributed to its success.

Adopted at the stated meeting of January 6th, 1909.

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President

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Secretary

Countersigned.....
Chairman of the Committee on
Science and the Arts.